

Reefs in Time and Space

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In summary, this large series still in progress is a most welcome and significant source of information for any paleontologist with interest in the subcontinent of Southeast Asia, which hitherto was so little known that much of the data presented here is new. Because of its geographical position, the area is also of special interest to paleobiogeographers with reference to the theory of plate tectonics. We ought to be particularly grateful to our Japanese colleagues for the consistently clear and comprehensible style. The series is in fact essential to any research library, but unfortunately, because of its substantial price, out of reach to most paleontologists.

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Reefs in Time and Space

Edited by Leo L. Laporte
*Society of Economic Paleontologists
 and Mineralogists, Special Publication
 18, 256 p., 1974.*
 SEPM and AAPG Members \$10.00,
 Others \$12.00.

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Some geologists might ask — What! another book on Reefs and Carbonates? But this reflects the large amount of research effort in this field, touched off by the discovery since the 1940s of petroleum deposits in carbonate buildups of Alberta and elsewhere. This publication, unfortunately delayed, results from a symposium entitled "Reef Complexes in Time and Space", organized by the Research Committee of the SEPM and held in Calgary, June 1970, at the annual meeting of the SEPM and AAPG.

So what is new? The book includes seven papers on wide ranging topics. The first three papers are concerned with Pleistocene events such as glacial sea level lowering, erosion and karst solution determining present-day reef configurations. A. L. Bloom's short paper discusses the "Geomorphology of Reef Complexes". He concludes that the concept of reefs as relict from a ten-foot stand of the sea a few thousand years ago needs to be carefully reexamined; rather reefs show every indication of being in dynamic equilibrium with the forces that now act on them.

E. G. Purdy's rather long paper on "Reef Configurations: Cause and Effect" is an examination of modern reefs, especially the extensive barrier reef and patch reefs of British Honduras. Purdy concludes that "many, if not most, of the shape attributes of modern reefs are fundamentally karst-induced rather than growth-induced". Acid solution experiments with limestone blocks indicates that meteoric water differentially lowers the central area and results in a partially or completely rimmed solution basin. A rise of sea

level permits coral colonization of the solution rim and any other topographic prominences. Atolls, barrier reefs and lagoon patch-reefs are related to a residual topography not a prior history of reef development. Can we find ancient reefs in the geologic column whose basic configurations are karst-induced?

Goreau and Land's paper on "Fore-reef Morphology and Depositional Processes, North Jamaica" is the first comprehensive paper to outline the characteristics of fore-reef and underlying fore-reef slope of a modern coral reef. A pronounced steep dropoff occurs between 55 and 65 metres below sea level. The authors conclude that these large scale geomorphic features are Pleistocene terraces mantled by recent reef growth. Rapid Holocene submarine lithification by Mg-calcite is widespread forming vertical to overhanging precipices. Abundant coarse blocks as well as fine sediment apparently creep slowly down the slope. When this work was carried out few divers and even fewer geologists had been down to depths of 100 metres. More recently geologists have used small submersibles not only in this area but also off British Honduras and Florida reefs.

P. H. Heckel provides an excellent summary of "Carbonate Buildups in the Geologic Record: a review". What in the world is a carbonate buildup? It is a general term to designate any "circumscribed body of carbonate rock which displays topographic relief above equivalent sediment and differs from typically thinner equivalent deposits and surrounding and overlying rocks". Heckel redefines reefs as a particular kind of buildup which displays evidence or potential for maintaining growth in the zone of waves. Heckel briefly summarizes possible modes of origin, and carbonate buildups in the geologic record from the Precambrian to Holocene. In addition he reviews the roles of skeletal contributors and nontaxonomic factors in these buildups. He concludes his paper with a general model for organic buildup formation and nine pages of references, including some 1973 references.

Wolfgang Krebs' paper "Devonian Carbonate Complexes of Central Europe" summarizes the data

concerning carbonate complexes of the Rhenish Schiefergebirge of the Variscan geosyncline. This is the first time that much of this information has appeared in English. In addition, considerable new data are presented on classification of these carbonate complexes, lithofacies, biofacies, diagenesis and paleogeography. The lithofacies and biofacies are well illustrated. Considerable data on age, thickness, size and shape are succinctly summarized in tables. These carbonate complexes occur on the southeast margin of the Old Red continent, on isolated submarine volcanic (ophiolite) rises in the internal part of the Rhenish Trough, and overlie crystalline rocks on the inner (southeastern) shelf. This paper is a very good starting point for any review concerning the Devonian buildups of Central Europe.

The paper by A. Bosellini and D. Rossi on "Triassic Carbonate Buildups of the Dolomites, Northern Italy" also makes available classical data not previously available in English. This paper provides a succinct summary of the Middle Triassic carbonates of the Dolomites. These authors show that a submarine topographic relief of between 700 and 1,500 metres, between the buildups and the surrounding basin, was attained gradually by accumulation of carbonate sediment on the buildups. These buildups were controlled by tectonic uplifts which localized carbonate sedimentation on these topographic highs. Carbonate sedimentation on these highs kept pace with rapid subsidence. The buildups appear to border a trough comparable in size to that of the Tongue of the Ocean. Bosellini and Rossi classify the buildups as stratigraphic reefs in the sense of Dunham (1970). This paper is complete with a series of superb photographs that would entice anyone to visit the Dolomites.

The final paper by R. K. Matthews concerns "A process approach to diagenesis of reefs and reef associated limestones". Matthews quite rightly stresses that "the diagenetic modification is a composite of numerous processes separated in time" and that nature is a very messy laboratory. He reviews the basic chemistry of carbonate diagenesis and

diagenetic environments and processes that occur near the earth's surface, written for geologists not sedimentary geochemists. The research carried out by Brown University up to 1971 on the Pleistocene carbonates of Barbados is summarized in this paper. Considerably more research has been done since then by both the Brown and McGill University groups and the interested reader should consult the relevant journals for these papers.

On the whole this is an excellent series of summary papers that in addition contain significant new ideas and new data. It nicely complements two other recent books: Milliman (1974) *Marine Carbonates* published by Springer-Verlag, and the *Comparative Sedimentology of Carbonates* symposium (Am. Assoc. Petroleum Geol. Bull., v. 58, no. 5).

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Dynamic Stratigraphy

by Robley K. Matthews
*Prentice-Hall, Inc., Englewood Cliffs,
 N.J., 360 p., 1974.*
 \$12.95.

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Taking *Dynamic Stratigraphy* from the shelf, and reading the sub-title in the jacket, and the Introduction, one would expect to enjoy an analysis of the stratigraphic record in the light of the new theories on global tectonics. This is not the case. Matthews has reached beyond hypothetical mechanisms, and he has succeeded in offering a vivid impression of an unsteady and non-uniform motion of the surface of Earth. His message is that changes occur, sometimes catastrophically, and they are recorded in vertical and lateral facies changes.

One goal of sedimentology and stratigraphy is to make people able to *read rocks* - that is, with understanding. This textbook is a guide through different stages of learning, first the sedimentary alphabet, then the spelling, and at the end a few interesting pages of geological history are offered for reading.

The book is subdivided into four major sections. The first part introduces the basic principles of stratigraphy, the philosophy of study, the reasons, sometimes practical ones, for this study, and briefly but effectively, a tombstone is placed on the old layer-cake concept - that was a useful field working tool in the past - and the new concept of facies and sequences of facies is put forward. It is unfortunate that the name of Walther, and his "Principle of facies correlation and variation" are never formally referred to.

In the second part (9 chapters, 120 pages) of the textbook, a classical approach has been taken in analysing the properties of sediments and sedimentary rocks, their generalized environments of formation, the principles of dating and correlating sedimentary deposits. The fourth chapter on the dynamics of the